Co-processing of Biogenic Feedstocks in Refineries: 1st Work Group Meeting

Transportation Fuels Branch
Industrial Strategies Division

December 13, 2016
Sacramento, CA

California Environmental Protection Agency
Air Resources Board

Agenda

- Welcome and introduction of technical experts
  - ❑ Robert Baldwin (NREL)
  - ❑ Joule Bergerson (Univ. of Calgary)
  - ❑ Helena Chum (NREL)
  - ❑ Corinne Drennan (PNNL)
  - ❑ Jim Rekoske (UOP)
  - ❑ Michael Talmadge (NREL)
  - ❑ Michael Wang (ANL)
- Staff presentation
- Panel member presentations
- Discussions with stakeholders
- Next steps

2

Objectives of the Work Group

- Evaluate greenhouse gas emissions of co-processing operations and corresponding carbon intensities of final product streams
- Understand drivers of the renewable fractions in finished fuel streams
- Develop guidelines to facilitate certification of carbon intensity for biogenic feedstock derived renewable product streams
- Explore operational and institutional challenges of co-processing biogenic feedstocks in process units such as fluid catalytic crackers and hydrotreaters

3

Objectives (cont.)

- Identification of technology barriers and potential solutions to incent co-processing deployment
- Compare best practices for co-processing modeling and quantification to inform the Low Carbon Fuel Standard program
- Evaluate the potential of co-processing to contribute to California's climate goals
- General knowledge sharing, discussions and research collaboration among stakeholders

4

Typical refinery co-processing

- Vacuum Gas Oil (VGO) in Fluid Catalytic Cracking Units (FCCs) with biogenic feedstocks

- Middle distillates in hydroprocessing units with biogenic feedstocks

- Refinery complexity may dictate specific process units being considered for co-processing

- Typical feedstocks likely to be used include bio-intermediates (e.g., pyrolysis oil), vegetable oil, tallow and used cooking oil

5

Other opportunities for co-processing

- The LCFS regulation currently includes a provision for the use of renewable hydrogen in refineries

  ❑ Potential for H_2 from Renewable Natural Gas (RNG) as a feedstock in co-processing

  ❑ Approaches to estimating carbon intensities for co-processing using renewable hydrogen

6

Critical issues related to co-processing

Renewable volume quantification

- Mass-balance approach?
  - ❑ Extrapolate pilot scale data to commercial scale
  - ❑ Quantifying mass of renewable fuels based on the mass of biogenic input
  - ❑ Consider only net hydrocarbon content of biogenic feedstock
- C^{14} isotopic analysis (EPA proposal)?

GHG emissions quantification

- GHG emissions
  - ❑ What energy consumption data to consider (refinery system boundary)?
  - ❑ Co-product allocation: refinery level or process unit level?
  - ❑ Feasibility of modeling energy consumption and associated GHG emissions using publicly available refinery models?
  - ❑ Accounting for additional hydrogen use and energy consumption

9

Tracking, monitoring and verification

- Chain of custody verification for feedstocks and renewable fuels

- Traceability of renewable content and verification

- Reporting and record keeping requirements

  - ❑ Finished fuel producer

  - ❑ Biogenic feedstock producer
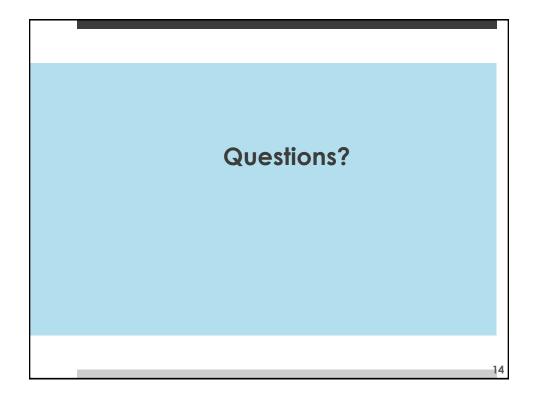
10

Other critical issues

- Feedstock storage and handling

- Catalyst activity and reactor integrity

- Impact of scale and operating conditions

- Water and oxygen in feedstock

11

LCFS pathway applications

- ARB has approved prospective pathways for Ensyn Corporation. Pyrolysis oil is co-processed to renewable gasoline and diesel with CIs ranging between 21-27 g/MJ

- A new co-processed renewable fuel application submitted in Q4, 2016

- Other applicants have discussed similar co-processed renewable fuel applications

12

Panel member presentations

13

Questions?

14

Stakeholder presentations?

15

Next steps

- Additional work group meetings
  - ❑ February 7, 2017
  - ❑ April 4, 2017
  - ❑ June and August 2017

- Draft white paper on co-processing

- For discussion at the next meeting
  - ❑ Propose LCA methodologies for co-processing
  - ❑ Consider approaches to quantification
  - ❑ Explore modeling to support quantification and CI estimation

16

Next steps

- Stakeholder inputs requested on:
  - ❑ Potential process units for co-processing
  - ❑ Specifics on H_2 derived from RNG in co-processing
  - ❑ Are there data from trial production runs?
  - ❑ New research reports on quantification?
  - ❑ Proposed quantification methods
  - ❑ Technological barriers to deployment of co-processing
  - ❑ Challenges to reporting and verification of finished fuel
  - ❑ Other comments to assist with objectives of this work group

17

Feedback

Feedback related to Co-processing Work Group Discussions should be sent to:
LCFSworkshop@arb.ca.gov
by January 16th, 2017

Presentations available at:
http://www.arb.ca.gov/fuels/lcfs/lcfs_meetings/lcfs_meetings.htm

18